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Moral Molecules and Love Drugs: Objectivity, Understanding, and Backtracking

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ABSTRACT: A case study of the ways that research on genetic and neurochemical changes that affect the social and sexual behavior of voles gets framed in the media illustrates the tensions science communicators often face between the dual goals of promoting public understanding while maintaining their objectivity. As a response to this ethical challenge, we argue that communicators could improve existing practices by striving to enable "backtracking."

KEYWORDS: backtracking, ethics of expertise, framing, oxytocin, public understanding of science, research ethics, scientific communication, vasopressin, voles

1. INTRODUCTION

Science communicators often find themselves caught in a conflict between two kinds of ethical norms. Experts are called upon to offer opinions or policy relevant recommendations to which their specialized work might be thought relevant. But the extent to which their opinions are properly regarded as authoritative often depends on the expectation that what they say reflects broad consensus among specialists in the area and that information is not simply being presented in such a way as to promote a particular set of interests. The difficulty is that the dual goals of promoting public understanding or advocating what one perceives to be the public good and maintaining objectivity often pull science communicators in different directions and can thus be hard to satisfy simultaneously.

We illustrate this tension using a case study of research on genetic and neurochemical changes that affect the social behavior and sexual behavior of voles and related studies that explore the effects of changes to the oxytocin and vasopressin systems in humans. As a response to the ethical challenge posed above, we suggest that communicators should strive to enable "backtracking" among information recipients – an approach that seeks to manage the tension between advocacy and objectivity by increasing transparency about the way that value judgments enter into scientific communication.

2. VASOPRESSIN AND OXYTOCIN RESEARCH IN VOLES AND HUMANS

Research on voles gives us a particularly intriguing example of how genetic variation at a single locus does sometimes make a significant difference, even in complex social behaviors. Specifically, prairie voles are relatively monogamous compared to montane and meadow voles. Prairie voles also have more vasopressin receptors in particular brain regions than montane and meadow voles because of a different promoter region for a gene (*V1aR*) associated with one of the subtypes of vasopressin receptor (the arginine vasopressin-1a receptor). This genetic difference can be manipulated in various ways that result in striking changes in social and sexual behavior. For example, biologists have inserted the prairie vole gene into meadow vole brains and the modified meadow voles displayed partner preference (Lim et al., 2004). Moreover, by blocking receptors, biologists can eliminate partner preference in both prairie voles and the modified meadow voles (Wang et al., 1999; Lim & Young, 2004; Donaldson & Young, 2008).[1]

There are good biological reasons to be cautious about how similar changes might translate into other species, including humans (Fink et al., 2006; Goodson et al., 2012; Young & Hammock, 2007). But there is also some evidence that suggests the neuropeptides vasopressin and oxytocin may be relevant to human social behaviors. For example, one study found statistically significant associations between a variant of a human vasopressin receptor gene and the reported quality of romantic relationships in men (Walum et al., 2008). Another study found that the difference of a single nucleotide in a human oxytocin receptor gene (*OXTR*) associates with traits reflecting pair-bonding in women (Walum et al., 2012). Another set of studies of the influence of oxytocin in humans investigating the behavioral effects of oxytocin externally administrated via nasal spray as subjects participate in various investment games, provides evidence for associations between oxytocin and prosocial behaviors such as trust (Kosfeld et al., 2005; Zak, 2005; Zak et al., 2005; Zak et al., 2006), generosity (Zak et al., 2007), and reciprocity (Zak, 2011). There is also evidence that participants with a shorter variant in the length of the promoter sequence for the *V1aR* gene tend to behave less generously than players with the longer version (Knafo, 2008). So there is indeed a growing body of evidence that the neuropeptides oxytocin and vasopressin and their receptors can have an important influence on individual human social behaviors.

As one might imagine, such research has attracted a great deal of media attention. Oxytocin has been characterized as a "trust hormone," "cuddle chemical," "love drug," or even as "The Moral Molecule" – metaphors that seem to promise a panacea for many of our social ills. With respect to vasopressin, variants of the *V1aR* gene have been heralded as a "gene for" "monogamy," "fidelity," or, when spinning it differently, "promiscuity," or "divorce". Attention-grabbing though they are, these beguiling catchphrases can frame discussion of larger issues of social and political interest or shape our understanding of ourselves as persons in ways that become as much sources of confusion as illumination (McKaughan, 2012; McKaughan & Elliott, 2012; McKaughan & Elliott, 2013).

3. FRAMING SCIENCE: MORAL MOLECULES AND LOVE DRUGS

[1] For a more detailed presentation of the biology and references to the relevant scientific literature, we refer readers to McKaughan 2012.

We identified several major frames that science communicators have been using in this case (McKaughan & Elliott, 2013). One frame is "genetic determinism," according to which a particular gene or molecule controls even complex social behaviors such as sexual monogamy. According to a second frame, "humans are like voles," key aspects of human behavior are influenced by the same factors that are present in voles, so research findings in voles can be employed reliably for understanding humans. According to a third frame, "saving your relationship," the lessons learned from the research can be used to develop drugs or other biotechnology innovations that can promote successful relationships or marriages.

Consider how each of these themes are woven together in a 2010 piece for *Psychology Today*. In "The Divorce Gene Explored: Should You Get Your Partner's DNA Before Saying 'I do'?" Dr. Shirah Vollmer, Associate Clinical Professor of both Psychiatry and Family Medicine at the David Geffen School of Medicine at UCLA claims:

> This research opens the door to medication to treat infidelity. If we improve the reward of vasopressin, then we increase the likelihood of faithful marriages. It also changes the valence of fidelity. If infidelity is a genetic variant, should physicians treat it like hypertension or diabetes? On the other hand, perhaps the infidelity gene is closely linked to the charisma gene, and as such, it is part of the package of seduction. . . . Studies in prairie voles confirms my sense that we are all wired differently, and hence we come into the world with a different interface. . . . Perhaps we could sum it up this way: monogamy, one part family values, one part vasopressin responsiveness.

Vollmer's reference to a "divorce gene" evokes the "genetic determinism" frame, while her claim that "studies in prairie voles confirms my sense that we are all wired differently" expresses the "humans are like voles" frame, and her suggestion that physicians could treat infidelity like hypertension or diabetes evokes the "saving your relationship" frame.

Other writers emphasize the "understanding human nature" frame which suggests that research may lead us to profoundly rethink our self-understanding. Setting out the thesis of his 2012 book on oxytocin, *The Moral Molecule: The Source of Love and Prosperity*, in a video on his promotional website (www.moralmolecule.com), Paul Zak, director of the Center for Neuroeconomics Studies at Claremont Graduate University, explains:

> My book, *The Moral Molecule: The Source of Love and Prosperity,* details how I discovered a brain chemical, oxytocin, that makes us moral. It tells us why we can be so wonderful to others and sometimes also so cruel. . . . It tells us why we are who we are.

There are evident pros and cons to the framing of scientific information in these sorts of narrative packages. Frames can, to be sure, help people to begin to make sense of a large and complex body of information or understand the potential significance of the voles research to a particular set of issues. But these frames can also be misleading and questionable, inviting public deference to experts on matters that may go well beyond what the evidence itself shows and in the face of a great deal of unacknowledged information that renders the topics taken up much more complex and difficult to address with confidence than they are made to seem.

4. BACKTRACKING

The frames at work in the examples from the previous section illustrate how scientific research is taken up in discussion of issues of broad social interest. How might communicators present information in such a way that does not preclude them from sharing their reflections on the

meaning and significance of their work while doing so in such a way that equips information recipients who are not in as good a position to evaluate the evidence as experts, but who may approach the interpretive process with different assumptions and values, to begin to think through the issues responsibly for themselves? The approach that we recommend is to enable what we call "backtracking" – a way of increasing transparency about the way that value judgments are entering into scientific research and communication (McKaughan & Elliott, 2012).

To backtrack is to go back over a path, to return to a previous point. In the context of science communication, the "path" is a metaphor for the interpretations or values or frames that have been applied to an issue. Experts enable information recipients to backtrack by making make information recipients more aware of the interpretive "path" that has been taken, by highlighting major assumptions and values involved reaching a particular conclusion.

Ideally, when scientists employ interpretive frames that incorporate value-laden assumptions, they would alert information recipients to the weaknesses of those assumptions, to the relative epistemic merits of those assumptions, and to alternative ways of framing the information based on different values and assumptions. They would also, ideally, provide information about the available data and the conditions under which they were generated. The goal is to enable recipients to retrace the inferential steps and value judgments by which experts arrive at theoretical and interpretive conclusions from their data, thus easing the tension between communicating in a manner that benefits the public and preserving the self-determination of information recipients.

In practice, facilitating backtracking involves things like attempting to be explicit about the major or potentially controversial points at which value judgments are entering and the acknowledging the limitations and epistemic status in of the conclusions drawn, so that they can be subjected to public scrutiny. By being more explicit about the role that particular values and assumptions are playing in scientific activity and in the interpretation of results and by distinguishing more carefully between relatively well-established results and more speculative claims, scientists can make it easier for non-experts to backtrack to relatively uncontroversial facts, so that information recipients are better equipped to recognize how these frames relate to their own values and perspectives. A wide variety of strategies may be helpful for promoting backtracking, with some strategies being more appropriate than others in particular cases. Such strategies could include acknowledging the weaknesses of one's chosen frames or interpretations, making one's data publicly available, identifying sources for information recipients to obtain further information, and fostering critical perspectives from scholars or NGOs or journalists (McKaughan & Elliott, 2013; Elliott & Resnik, 2014).

5. RECOMMENDATIONS IN THE VOLES CASE

We think that science communicators could take a number of relatively simple steps to promote backtracking in the voles case. Several of the frames identified in Section 3 can be potentially misleading, and communicators can provide a few cautionary comments to help information recipients to understand these weaknesses. For example, in the "humans are like voles" frame, one point that can easily be confused is that the biologists' technical term "monogamy" differs substantially from ordinary uses of the term, where people typically have in mind a sexually exclusive relationship with one partner. Biologists typically are talking about social monogamy, which involves preferential association and cohabitation with a partner but is compatible with

extra-pair copulations that would be incompatible with "monogamy" or "fidelity" as these are typically used in ordinary discourse for describing long term human relationships (Young & Hammock, 2007). Making this basic point can go a long way toward dispelling misconceptions that might arise in connection with talk about genes for divorce or medications that might treat infidelity.

Another strategy for helping information recipients to understand the weaknesses of the "humans are like voles" frame is to clarify that what we are learning about the voles may not translate into human behavior in any clear or straightforward way. It is worth noting that scientists are often already trying to do this sort of thing. For example, Thomas Insel, one of the key early figures in this work and now director of the National Institute of Mental Health, recommends that we take oxytocin and vasopressin receptor genes as "reasonable candidates to study in humans, recognizing that species differences are the hallmark of nonapeptide evolution" (Insel, 2010). Similar points can be made about the "genetic determinism" frame. Developmental factors and social experiences are extremely important influences on human behavior, which means that changes in individual genes may not translate into straightforward behavioral differences. Biologists who work in this area know that, even in voles, "the prairie vole brain is exquisitely sensitive to the influence of social experience which shapes the expression of behaviorally relevant genes" (McGraw et al., 2008, p. 1).

While science communicators can promote backtracking by providing clarifications and acknowledging weaknesses, but they may sometimes conclude that particular frames are particularly confusing or difficult to backtrack from. For example, reporting a story on "The Cheatin' Gene: Researchers Find Men May Be Genetically Predisposed To Cheat" for the *NBC Nightly News*, anchor Brian Williams tells us:

> Throughout history men have come up with all sorts of excuses for behaving badly. Now it appears they have a new one. It's in their genes, apparently. This is a line of research that started with rodents called voles. Now it's being applied to humans. Our chief science correspondent Robert Bazell explains.

After hearing this kind of information, a woman who was interviewed by NBC's *Today Show* concluded, "I would want to have my mate tested. . . . And I am single and that would secure my marriage." If this is the kind of message expressed by using the "genetic determinism" or the "saving your relationship" frames – an impression of scientific consensus that the complex behaviors in human relationships are in some straightforward way controlled by our genes and that it is now sensible to think about making major life decisions on this basis – science communicators should think twice about using these frames.

Of course, we acknowledge that an individual scientist who is being interviewed by a journalist writing a story on his or her work might have very little control over how the research is eventually framed. But we would emphasize two points. First, backtracking, is a responsibility of the entire community of those involved in science communication – including experts, members of the media, and critics. Second, if an expert feels uncomfortable with the direction a reporter seems to be taking a story, it may not be difficult to say so and to suggest an alternative way of seeing things (e.g., rather than focusing on marriage and sex, one could explore the possibilities such research might open up for treating autism spectrum disorders or encourage people to think about other aspects of the research's significance). Scientists could also insist that if they are to be quoted, certain qualifications should be included in the piece.

6. CONCLUSION

We have emphasized the importance of balancing the dual goals of promoting objectivity and understanding in science communication. The public has much to gain from science communicators who are willing to weigh in on issues of public interest. But such comments are of greater worth when the values and assumptions that underlie them are visible in the light of day so that these too can be more readily subjected to public scrutiny and to open and ongoing discussion. Communication geared at enabling backtracking helps non-experts to gauge the extent to which information could be interpreted differently or whether individuals might reasonably come to different conclusions about a particular set of claims. By enabling backtracking, science communicators provide information that opens opportunities for individuals who are uncertain about whether they should trust expert opinion in a given case to identify key points at which they might investigate the issues further for themselves.

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